



8 May 2001

Mr. Lonnie J. Monaco, P.E.
Remedial Project Manager
Department of the Navy
Engineering Field Activity Northeast
10 Industrial Highway, Mail Stop 82
Lester, Pennsylvania 19113-2090

RE: Final Letter Work Plan for the Direct-Push Investigation of the Southern Boundary
and near Site 11, Naval Air Station, Brunswick, Maine
EA Project No. 29600.47

Dear Mr. Monaco:

EA Engineering, Science, and Technology is pleased to submit this final letter Work Plan for the direct-push investigation to fill data gaps identified during a technical meeting held on 13 and 14 December 2000. The two data gaps that will be investigated include the Southern Boundary of the Eastern Plume, and an area in Site 11 (former location of MW-323). EA is proposing to use electrical conductivity (EC) probe and membrane interface probe (MIP) technologies, advanced with a direct-push drill rig, to obtain additional subsurface data to identify potential preferential migration pathways for contamination in these areas. These areas represent portions of the Eastern Plume and Site 11 (identified as a source area of the Eastern Plume) where unidentified conduits for ground-water flow have been hypothesized by the U.S. Environmental Protection Agency and others. In an effort to assess the potential for these hydraulic conduits, an EC probe will be advanced to assess the horizontal distribution of geologic units. In addition, selective locations will be logged with an MIP, and ground-water samples will be collected using the direct-push method.

The EC/MIP technology will provide real-time qualitative data of subsurface conditions, including the lithology and distribution of volatile organic compound (VOC) concentrations in both the vadose and saturated zones. The EC/MIP logging direct-push technology will be completed at locations up to an anticipated depth of 80 ft below ground surface. The two study areas are shown on Figure 1.

Based on the results of the direct-push EC/MIP investigation, ground-water samples will be collected using direct-push techniques and submitted for laboratory analysis of VOCs by U.S. Environmental Protection Agency Method 8260B.

OBJECTIVE

The objective of this Work Plan is to outline the MIP and EC direct-push investigation to achieve the following:

- Obtain additional subsurface geological data to augment the existing dataset in the study areas
- Assess whether preferential migration pathways (i.e., sand channels within the transition unit) are located along the Southern Boundary of the Eastern Plume
- Assess whether bedrock near MW-323 is in contact with the upper sand interval, or whether a clay layer covers this inferred bedrock knob
- Determine the lateral and vertical distribution of VOC impacts in the study areas.

ORGANIZATION

This letter Work Plan presents the overall approach and details project activities that will be performed during the EC/MIP direct-push investigation, details site-specific investigation activities and sampling rationale, and describes the field investigation and sampling procedures that will be used. These activities will be conducted in accordance with the base-wide Safety, Health, and Emergency Response Plan that has been completed and includes the Eastern Plume (EA 1997¹). The Quality Assurance/Quality Control Plan for this investigation was provided in Appendix B of the Long-Term Monitoring Plan for Sites 1 and 3 and Eastern Plume (EA 2000²), which provides the technical guidelines and quality control procedures for conducting the field work.

DIRECT-PUSH INVESTIGATION

Southern Boundary Investigation

The primary goal of the Southern Boundary investigation is to obtain data on site geology and VOC distribution. EC logging results will be used for identification of potential water bearing intervals, including the lateral extent of the lower sand interval. The direct-push activities will utilize a truck-mounted Geoprobe[®] drilling rig used to drive the EC probe and MIP. The EC probe will be used to provide lithologic information on the unconsolidated deposits underlying the site. The EC probe will be used at approximately 5 initial locations. Based on the results of an initial phase of EC logging, up to 5 additional EC logging points will be selected to bound the extent of the lower sand interval, or delineate units which may be preferential flow pathways, if

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1. EA Engineering, Science, and Technology. 1997. Basewide Safety, Health, and Emergency Response Plan, Naval Air Station, Brunswick. June.
 2. EA Engineering, Science, and Technology. 2000. Final Long-Term Monitoring Plan for Sites 1 and 3 and Eastern Plume, Naval Air Station, Brunswick, Maine. February.

identified. Geologic data from previously installed monitoring wells, cone-penitrometer logs, and EC logs in the Southern Boundary will be used to aid the interpretation of EC logs. The EC probe will be extended through the transition unit into at least 10 ft of the underlying Presumpscot Clay. This clay is believed to be greater than 10 ft thick in this area and, therefore, the EC probe refusal at bedrock or till is not anticipated.

The MIP will be used in conjunction with EC logging at approximately 5 locations (Figure 2). The MIP will be used to detect concentrations of VOCs that may be present in the vadose and saturated zones. The MIP has a detection limit of approximately 100 µg/L for total VOCs. Therefore, the MIP will be used as a screening tool to assess the southern extent of the Eastern Plume in the southwest portion of the study area.

The initial round of EC logs will be distributed in areas where potential sand conduits have been suggested, including the vicinity of CP-142, and west and southwest of CP-118. EC borings will be located along existing access roads and will be positioned in areas that do not require clearing or new road installation. Spacing of the EC/MIP borings will be dependent on the findings of the initial EC logs. Borings may be grouped together in areas identified as having a potential ground-water conduit. Ground-water samples will be collected from selected direct-push locations in order to correlate quantitative analytical data results with qualitative results of the MIP.

Based upon the results of the EC/MIP investigation, two 1-in. diameter piezometers would be installed to evaluate the deep ground-water flow in the Southern Boundary area. One piezometer would be installed near CP-118 and approximately 250 ft north of CP-142. The proposed piezometer locations are shown in Figure 2.

Site 11 Investigation

The primary goal of the investigation at Site 11 is to assess whether a potential pathway may be present which could have allowed contaminants in the overburden to contact bedrock. Near the mapped location of MW-323 (no longer present) and CP-146, a bedrock knob appears to be present which may or may not be in contact with the upper sand interval. This bedrock knob has been hypothesized by EPA to be a potential pathway from the overburden into bedrock. In order to assess whether a fine-grained unit such as silt or clay (i.e., potential aquaclude) overlies bedrock, the EC probe will be advanced at 5 locations surrounding the inferred bedrock knob. These locations are shown on Figure 3. Based on the findings of these EC probes, additional EC logs may be advanced to map the extent of the bedrock knob, or overlying clay unit.

The MIP will be used in conjunction with EC logging at approximately 5 locations (Figure 3). The MIP will be used to detect concentrations of VOCs that may be present in the vadose and saturated zones. The MIP has a detection limit of approximately 100 µg/L for total VOCs. Therefore, the MIP will be used as a screening tool to assess whether elevated concentrations of VOCs may be present in soils directly above where bedrock may be exposed to the upper sand interval. The combined results of the EC and MIP logging will be used to assess the potential for overburden flow into bedrock at this area.

EC borings will be located along existing access roads and will be positioned in areas that do not require clearing or new road installation. Spacing of the EC/MIP borings will be dependent upon the findings of surrounding borings.

GROUND-WATER SAMPLING AT DIRECT-PUSH LOCATIONS

Objectives and Scope of Work

The objectives of the direct-push sampling are to assess the extent of VOCs with depth and to provide a quantified result for MIP response. The direct-push sampling method will allow sampling of ground water at discrete depths, and will provide information that will be used to determine the southern extent of the Eastern Plume, and to assess whether VOCs may be present in ground water immediately above the bedrock at Site 11. Approximately 10 ground-water samples will be collected as part of the Southern Boundary investigation. Approximately 5 ground-water samples will be collected as part of the Site 11 investigation. The actual number of ground-water samples will be based on the findings of the EC and MIP logging, and on observations made during the investigation.

Sampling Intervals

The depth intervals that will be sampled in the Southern Boundary investigation will be based on EC indications of the deep sand, or other preferential flow pathways. The depth intervals that will be sampled in the Site 11 investigation will be from the interval immediately above bedrock and/or clay based on the EC logs. In addition, ground-water samples will be collected to calibrate the results of the MIP (i.e., ground-water samples will be collected in intervals if the MIP indicates VOCs may be present).

The direct-push ground-water samples will be analyzed by a State of Maine-approved laboratory for the parameter Target Compound List VOCs by U.S. Environmental Protection Agency Method 8260B.

Sampling Method

The direct-push sampling procedure will be performed using a truck-mounted Geoprobe® where the sample probes will be advanced under hydraulic pressure to the desired sampling depth. The sample container and preservation requirements for these aqueous sample analytical methods are listed in the following table:

Parameter	Volume Required	Container	Preservative	Holding Time ^(a)
Direct-Push Ground-Water Samples^(b)				
ORGANICS				
Target Compound List	80 mL	Glass, teflon-lined	Cool, 4°C	14 days
Volatile Organics		septum	HCL to pH <2	
(a) Holding time requirements are from sample collection.				
(b) From time of sample collection (40 CFR Part 136.3).				

DECONTAMINATION PROCEDURES

To minimize the potential for cross-contamination between sample locations, reusable sampling equipment and direct-push equipment that contacts site soils will be decontaminated via steam cleaner wash before and after the first direct-push rod is advanced and after each subsequent location. Direct-push EC/MIP logging and ground-water samplers will be steam cleaned and then decontaminated as described below before and after each use. Steam cleaning will be conducted at a pre-approved (by supervising geologist as coordinated with Naval Air Station Brunswick facility personnel), centrally located decontamination pad.

The procedure for cleaning EC/MIP logging equipment, direct-push samplers, and stainless steel hand tools and water level/interface probes is as follows:

- Wash with potable water and laboratory-grade detergent (e.g., Alconox[®] detergent)
- Rinse with potable water
- Rinse with deionized water
- Rinse with methanol
- Rinse with deionized water
- Air dry
- Wrap in aluminum foil if equipment will be stored.

The decontamination area will contain a wash solution collection system. The collected material will be contained in U.S. Department of Transportation-approved 55-gal drums. Drums will be labeled and moved to the ground-water treatment plant. The water will be treated at the Brunswick Ground-Water Extraction and Treatment System facility.

MANAGEMENT OF INVESTIGATION-DERIVED WASTES

Waste materials generated during the field investigation will include:

- Sampling fluids
- Decontamination fluids
- Used personal protective equipment.

These wastes will be contained, labeled, and handled in the following manner:

- Liquids and decontamination fluids will be collected and contained in U.S. Department of Transportation-approved 55-gal drums. Filled drums will be returned to the ground-water treatment plant facility and treated via the current treatment process.
- Used personal protective equipment will be double-bagged and disposed of onsite as general refuse.

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LOCATION SURVEYING

The direct-push EC/MIP probe points and ground-water sampling locations and elevations will be surveyed for horizontal and vertical positions. A State of Maine Licensed Land Surveyor will perform the survey work. Control points will be established onsite using local benchmarks, or Global Positioning System techniques, if required. The horizontal control of each specified point will be determined and reported based on the Maine State Plan Coordinate System. Vertical control will be established in accordance with National Geodetic Vertical Datum.

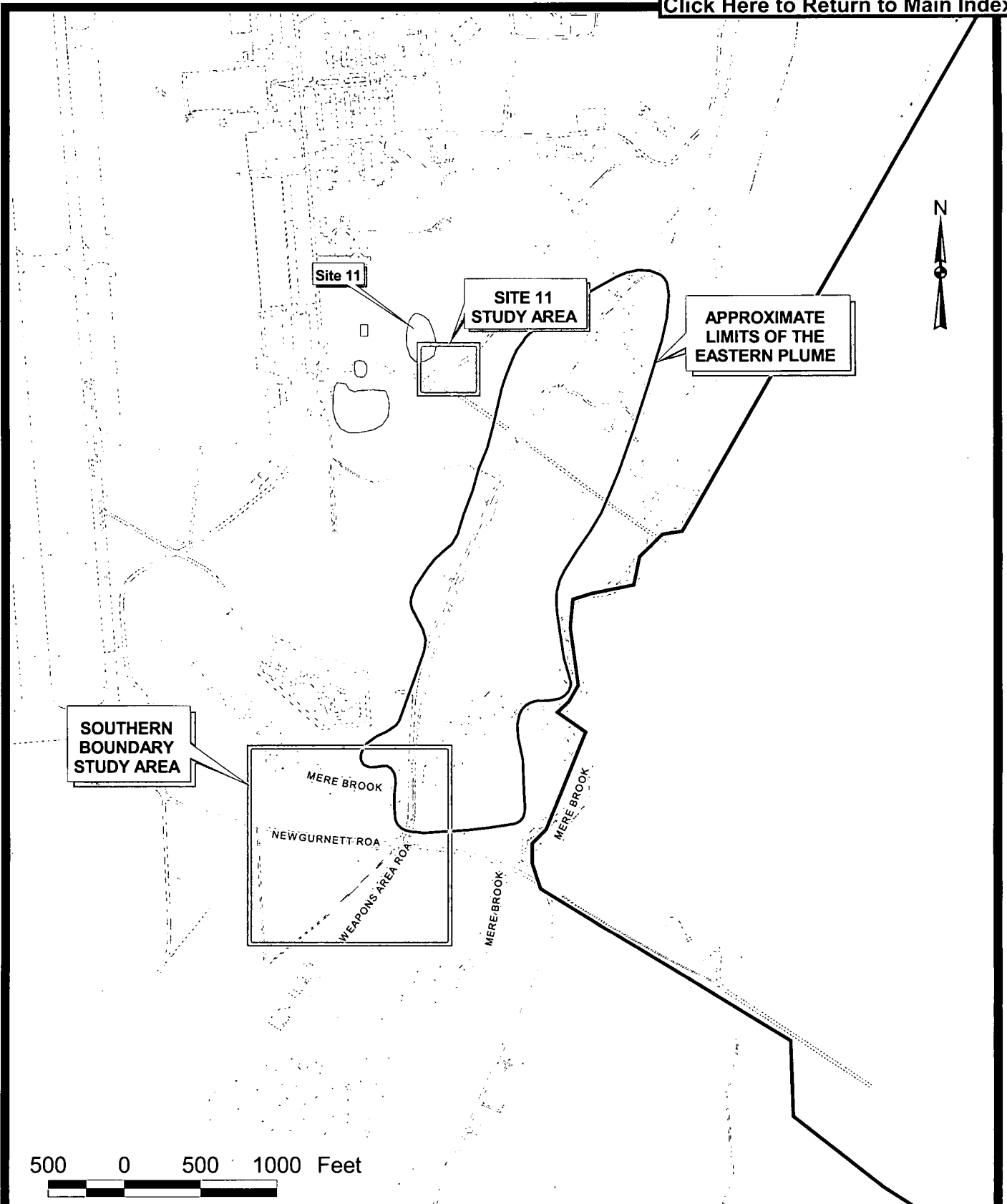
If you have any questions or comments about this report, please do not hesitate to contact me.

Sincerely,



Alexander C. Easterday, P.G.
CTO Manager

ACE/caw



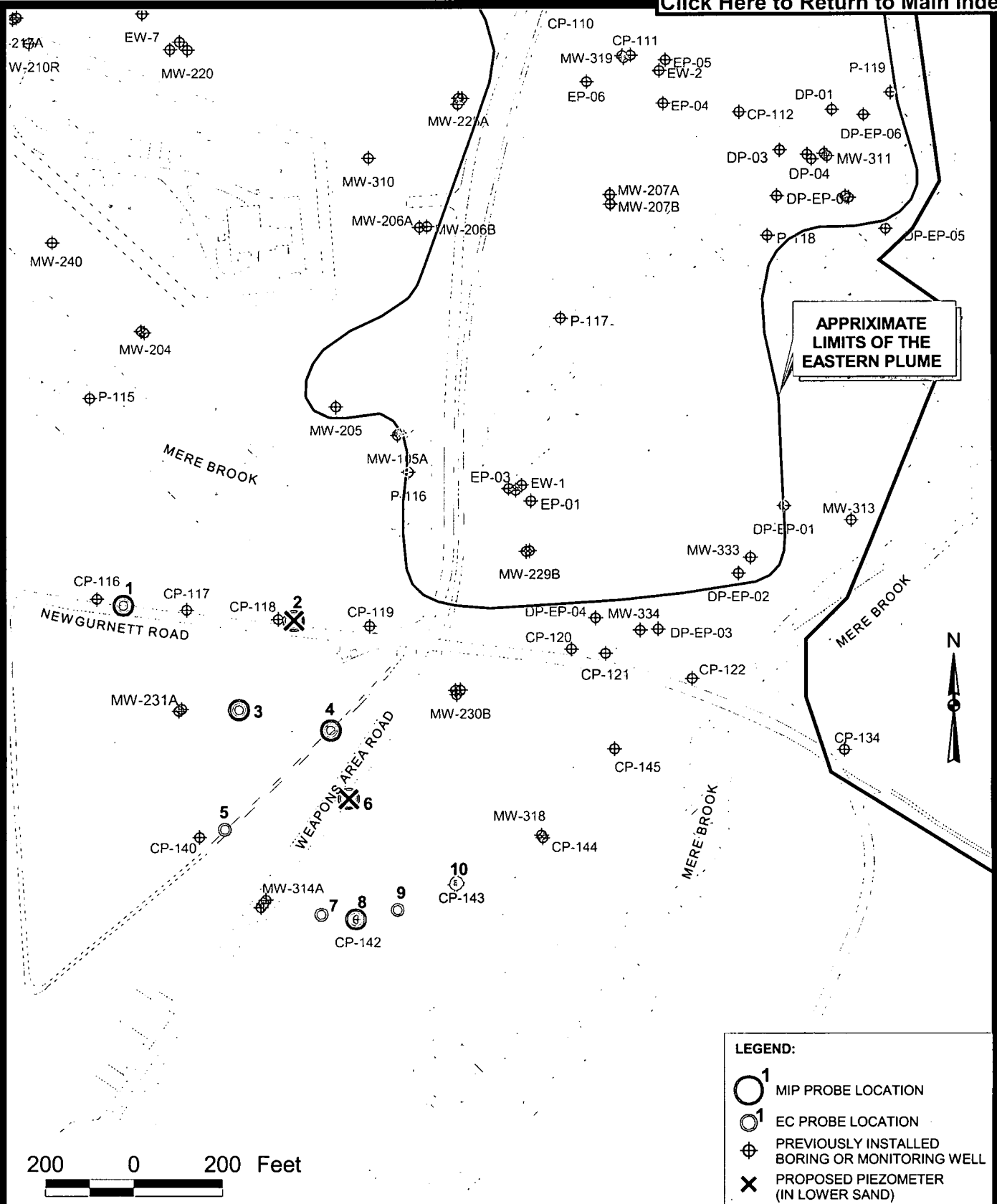
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FIGURE 1
EC AND MIP STUDY AREAS

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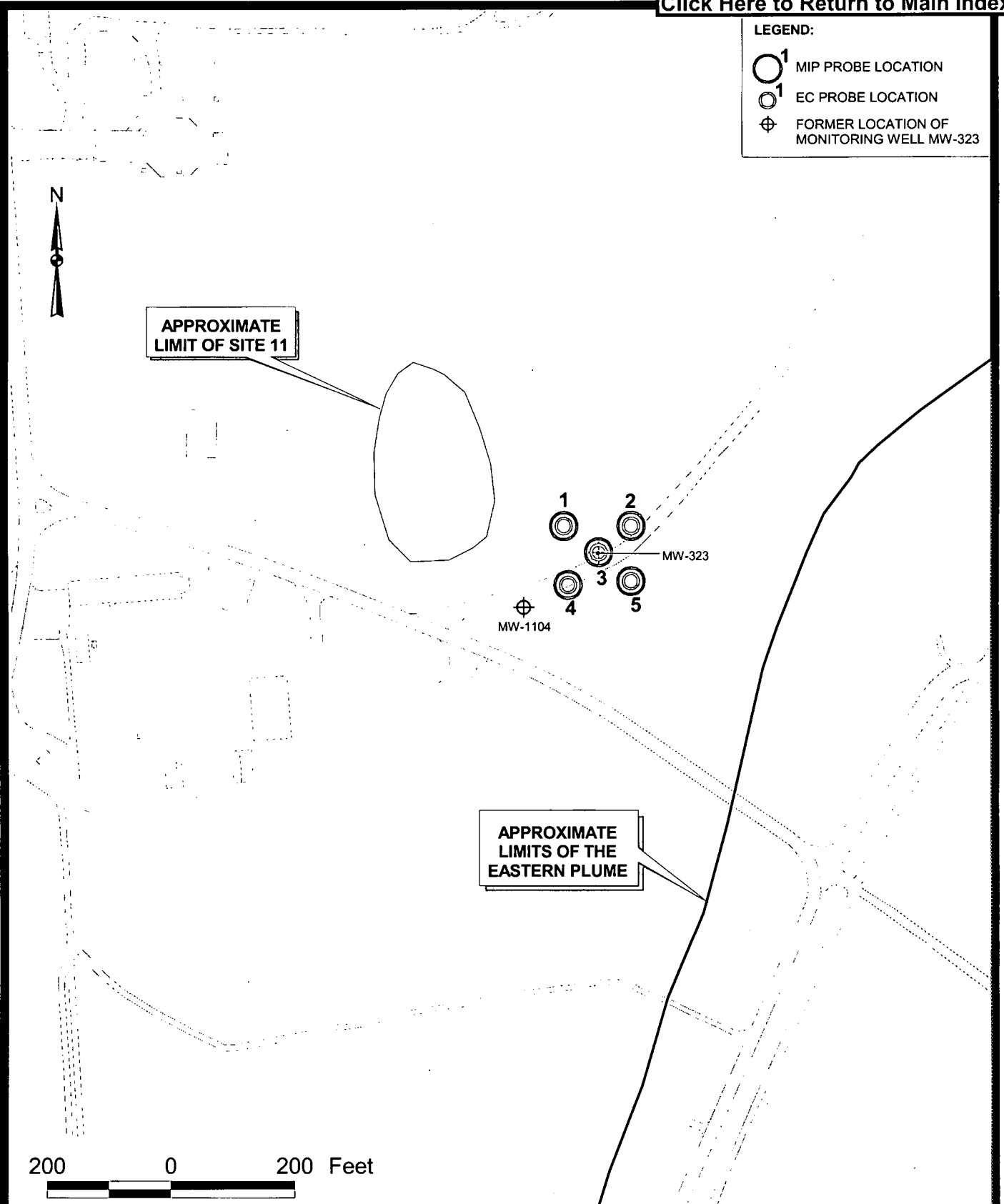
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FIGURE 2
PROPOSED EC/MIP PROBE LOCATIONS
IN SOUTHERN BOUNDARY STUDY AREA

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT No	FILE No
PLN	PLN	BT	PLN	AS SHOWN	27 DEC. 2000	29600.47	I:\NASB_GIS NAVY.APR

LEGEND:

-  MIP PROBE LOCATION
-  EC PROBE LOCATION
-  FORMER LOCATION OF MONITORING WELL MW-323



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FIGURE 3
PROPOSED EC/MIP PROBE
LOCATIONS IN SITE 11 STUDY AREA

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT No	FILE No
PLN	PLN	BT	PLN	AS SHOWN	27 DEC. 2000	29600.47	I:\NASB_GIS NAVY.APR